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**DETAILED DESCRIPTION**


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[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the metal of hollow structure, or the golf club head made of a fiber reinforced plastic.

[0002]

[Problem(s) to be Solved by the Invention] The flight distance of the ball in golf is dependent on the kinetic energy of the head which a club head collides and gives to a ball. Since it is proportional to the square of head speed, in order to lengthen the flight distance of a ball, as for the kinetic energy of this head, it is effective to raise head speed. In order to raise this head speed with few myodynamia, lightweight-izing of a head is effective. From such a viewpoint, the head of the hollow structure called a metalhead and carbon head has been gaining power in the field of a wood type club head in recent years.

[0003] By the way, it became clear that the energy which a face bends in the direction of a fly and opposite direction according to the load generated when it collides with a ball, since a face has the property of a spring about the collision with a head and a ball in the case of the hollow head which a face becomes from elastic material when it inquires, an experiment and, and the artificers of this application give to a ball according to the stability of the bending influences flight distance. Then, artificers inquired about whether it is effective, when giving the above-mentioned stability to the ball in what form.

[0004] As a result of carrying out the simulation of the relation between the initial velocity of the ball at the time of making a head collide with a ball under some conditions, and the spring constant of a face, it became clear that a spring constant takes for becoming small and the initial velocity of a ball increases (refer to drawing 11 ). It can be said that flight distance is extended, so that a spring constant is small as long as this experimental data is seen since the flight distance of a ball is proportional to initial velocity needless to say.

[0005] However, if the face of the club head of hollow structure is simplified and considered, the distribution of the bending moment at the time of a load joining a face is approximated to an ends supporting beam (refer to drawing 12 ). Therefore, when the thickness of the whole face is uniform, you have to set up the thickness of the whole face on the basis of the required intensity of the blow section of the center of a face where the bending moment serves as the maximum. Therefore, it was difficult to set the spring constant of a face as a desirable value.

[0006] this invention is thought out for the purpose of offering the possible golf club head of lengthening the flight distance of a ball more, when such a trouble is canceled, shock-resistant intensity and a low spring constant are reconciled and it hits at the same head speed.

[0007]

[Means for Solving the Problem] In order to achieve such a purpose, in this invention, the blow section which has the intensity which can bear the structure of the golf club head of hollow structure at the shock when hitting a ball into the portion of the predetermined range of the center of the face section

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shall be prepared, and the portion which has a small spring constant around the blow section in the face section as compared with the blow section shall be prepared. It specifically compares with the thickness of the blow section. make thickness of the circumference of the blow section thin, or Or it is good for the inside of a face to form the circular sulcus surrounding the blow section. Moreover, a head is formed by the fiber reinforced plastic, as compared with the fiber density of the blow section, fiber density of the circumference of the blow section shall be made low, the quality of the material of the fiber of the blow section and its circumference shall be differed mutually, or thickness of the fiber of the circumference of the blow section may be made thin as compared with the thickness of the fiber of the blow section.

[0008]

[Embodiments of the Invention] With reference to an attached drawing, the composition of this invention is explained in detail below.

[0009]

[Example 1] Drawing 1 and drawing 2 show the head 1 of the driver constituted based on this invention. The face 2 of this head 1 takes the composition from which thickness changes to two stages which made the portion of the predetermined range corresponding to the central blow section 3 comparatively heavy-gage, and used the periphery as thin meat.

[0010] Since the bending moment of the center of a face becomes the highest and the bending moment of the circumference becomes low as the distribution of the bending moment shown in drawing 12 shows, if the thickness  $t_1$  of the blow section 3 is set as sufficient thickness on intensity, thickness  $t_2$  of the circumference can be made thin as compared with the thickness of the blow section 3. Thereby, the spring constant as the face 2 whole can be set up low. In addition, the boundary where thickness changes can avoid that the portion of thin meat fractures by making it in agreement with the position where the bending moment shown in drawing 12 becomes 0 in general.

[0011] The spring constant at the time of setting up the thickness of the face 2 whole uniformly based on an opposite impact load (2.55mm) and the thickness  $t_1$  of the blow section 3 show comparison with the spring constant at the time of using surrounding thickness  $t_2$  as thin meat (1.45mm) to drawing 3 as it is.

[0012] According to this, since the average wall thickness of the face 2 whole is reducible, low center-of-gravity-ization of a head can be planned by adding the part to a SOL side, without increasing a whole weight.

[0013] Drawing 4 is a graph which shows the result which conducted the blow experiment and measured the relation between head speed and the flight distance (carry) of a ball by three heads from which a spring constant differs. According to this graph, it turns out that the flight distance of the maximum [ speed / head / thing / of the minimum / spring constant / in the field of 40 or less m/sec ] was able to be obtained. Moreover, according to this graph, if a spring constant is made small, there is a field which cannot necessarily be declared that flight distance is extended. That is, it can be guessed that the field where head speed exceeded 40 m/sec is a thing with the optimal spring constant for lengthening flight distance according to head speed. anyway, the thing which can be developed for flight distance at the same head speed by setup of a spring constant -- being also indistinguishable -- it is the fact which is not

[0014]

[Example 2] A cross section makes the shape of a convex lens by making the inside of the blow section 3 into a flat side, or what was shown in drawing 5 carrying out considering as the spherical surface of bigger curvature than outside curvature, since the superficies of a face 2 are generally the spherical surface of the proper curvature  $R$  etc., and changing the thickness  $t_3$  continuously and connecting it to the thickness  $t_4$  of a surrounding thin-walled part smoothly.

[0015]

[Example 3] It is made for the spring constant around the blow section 3 to become small by what was shown in drawing 6 and drawing 7 making the face 2 whole the thickness  $t_5$  which can bear the bending moment, and forming a circular sulcus 4 so that the blow section 3 may be surrounded to the inside of a face 2. In addition, making a circular sulcus 4 in agreement with the position where the bending moment

becomes 0 also in this case cannot be overemphasized. Moreover, although it is necessary to make the cross-section configuration of a circular sulcus 4 into the configuration where stress concentration was avoided, as shown in drawing 8 , it can be carried out in various modes.

[0016] An effect not only with a perfect circle but an ellipse as showed drawing 9 and drawing 10 or an ellipse same [ the profile configuration of the boundary of a portion where the thickness shown in the above-mentioned example changes ] is acquired.

[0017] When forming a hollow head by the fiber reinforced plastic, making fiber density of the circumference low, differing mutually the quality of the material of the fiber of the blow section and its circumference, or making thickness of the fiber of the circumference thin as compared with the thickness of the fiber of the blow section as compared with the fiber density of the blow section, can attain the purpose of this invention similarly.

[0018]

[Effect of the Invention] Thus, since the spring constant of the whole face can be made small after securing the intensity which can bear the shock at the time of colliding with a ball according to this invention, the tunable range of a golf club is expanded. Therefore, it is set as the property of a request of a club head, and the flight distance at the time of hitting at the same head speed is lengthened further upwards, and a big effect is acquired.

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[Translation done.]